# STATE & PRIVATE FORESTRY
## FOREST HEALTH PROTECTION
### SOUTH SIERRA SHARED SERVICE AREA

**Report SSSA 13-5**

Date: June 19, 2013
File No. 3420

**To:** **Nancy Gibson, Forest Supervisor, Lake Tahoe Basin Management Unit**
**Jeff Marsolais, Deputy Forest Supervisor, Lake Tahoe Basin Management Unit**
**Kathy Murphy, Vegetation Resource Staff Officer**
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**Subject:** **Insect and Disease Evaluation for Silvicultural Certification Stands, Unit #13 and 8, Carnelian Sale, Lake Tahoe Basin Management Unit**

On June 19, 2013, Forest Health Protection (Beverly M. Bulaon, Entomologist; Martin MacKenzie, Pathologist) accompanied Paul Guarnaccia (Assistant Silviculturist, LTBMU) for a field assessment of treatment units that he had selected for his silvicultural certification. Also accompanying the group were John Washington, LTBMU Fuels Officer and Kyle Jacobson, LTBMU Assistant Fuels. The purpose of the field visit was to assess the units for current insect and disease concerns, discuss potential risks and management related to observed conditions, and provide recommendations if necessary.

**Background**

The Carnelian project is located west of Kings Beach, along the northwestern shore of Lake Tahoe Basin Management Unit. Project areas are upslope and adjacent to heavily populated housing communities which delineate most units as WUI defense zone fire protection zones (DFPZ). Elevations range from 6300-8000 feet, south-facing slopes. Units 13 and 8 were selected by Paul for certification, and are similar in forest composition and diversity (Unit 8: Township 16N, Range 17E, Section 10; Unit 13: Township 16N, Range 17E, Section 16). Both sites are categorized as Sierra mixed conifer: white fir dominate by nearly 55% of standing and dead trees, with Jeffrey at 30 % of standing and dead trees, sugar pine at 15% standing and dead trees, and 3% sparsely scattered incense cedar. Unit 13 has 236 ft2/acre, 459 site density index (SDI), and 8.6 quadratic mean diameter (QMD) (see Figure 1); Unit 8 has 188 ft2/acre, 317 SDI, and slightly higher QMD at 12.0 (see Figure 2). The low QMDs are the result of prolific white fir regeneration in the understory. Sites are historically Jeffrey pine type but have transitioned into white fir dominant in the last century. Like most areas surrounding Lake Tahoe, this area was clearcut during the Comstock years, and growth is primarily secondary. Understory vegetation was thickest in open meadows, composed of huckleberry oak, deer brush, greenleaf manzanita, and pinemat manzanita.

Both units had been previously salvage-logged in the mid-1990's of overstory fir killed by fir engraver bark beetle. Since then, units have not been treated except lightly along the edges that are directly adjacent to roads for public safety. Therefore ground fuels are still high: fuel loading in Unit 13 is 39 tons/acre, while Unit 8 is nearly the same at 32 tons/ac.

**Figure 1.** Unit 13, Carnelian Project, hand-thinning treatment unit.

**Figure 2.** Unit 8, Carnelian Project, mechanical thinning treatment unit. Note higher density of stems and ground fuels.

**Pest Observations**

Due to the high prevalence of true fir, fir engraver (*Scolytus ventralis*) is the predominant disturbance agent on these sites. Activity is currently at background levels – scattered mortality within units, all age classes affected, about one tree/acre annual loss. Mature overstory firs display evidence of past attack with multiple leaders and dead terminals. As often observed at the fringes of gap openings, firs of varying sizes die off most likely due to high sun exposure and slightly drier conditions. Fir engraver activity was observed on all downed trees within the openings.

Non-native white pine blister rust (*Cronartium ribicola*) was only observed on a few sugar pines in the proposed units. Infected trees displayed only one branch dieback or flag; overall about a 10% infection level was determined for the sites.

*Heterobasidion occidentale* also known as Annosum root disease (formerly *Heterobasidion annosum, S-type*) was only found in Unit 8, but not Unit 13. Although a decay pattern symptomatic of H. occidentale was not observed in Unit 13, one fir stump was observed that had been hollowed out by a white rot fungus and in a way that is consistent with very advanced Heterobasidion rot. The dominant stump and log decay pattern observed in Unit 13 was that of brown rot fungi (which Heterobasidion is not). In Unit 8, downed trees displayed all symptoms of *H.occidentale*: laminated rot, snapped at root base, and openings with declining trees. Borate-based disease prevention treatments were not implemented during previous logging activities which likely contributed to the high prevelance of infection in Unit 8.

Western dwarf mistletoe (*Arceuthobium campylopodum*) on both red and white firs was low to moderate infection levels at both units. No pines were noted with dwarf mistletoe. The dominant pest of the younger fir age classes in Unit 13 was apprently the dwarf mistletoe. Numerous trees less than 8 ft tall, were observed with heavy mistletoe infections which were frequently on the main stem. Left untreated, these infections will devlope into undesirable hip cankers. However, there were also a number of apparently noninfected trees. If the small infested trees are allowed to grow into overstory trees, mistletoe infections will grow with them and rain seeds down on the future fir regeneration.

The dominant pest of the fir age classes larger than poles in Unit 13 would appear to *Cytospora abietis* branch infections. These branch infections cause dieback, and in drought years may stress fir trees to the point that they subsequently are attacked by fir engraver or other damaging agents. The *Cytospora* fungus gets established in fir trees after dwarf mistletoe plants die. *Cytospora* spores germinate and grow down the branch wound left by the mistletoe plants. These wounds provide entry point the branch canker fungus.

**Discussion**

The objective for the Carnelian project is forest health improvement and fuels reduction. While annual aerial surveys of the Carnelian area have been relatively low for the past decade, prevention before large scale pest outbreaks is the most effective management for forest health. Density reduction of trees will not just reduce basal area, but removal of the most heavily infected dwarf mistletoe understory trees will provide balance of pest presence in units. Reduction of inoculum in the units will reduce current and future infection levels. The target to reduce SDI by 30% of maximum for unit 8 and 10% of maximum for Unit 13 will provide optimum growing conditions as well as provide fire protection for surrounding communities. Reverting stands back to predominantly pine will reduce resource competition between trees, and improve stand resilience in case of a catastrophic wildfire. Unit 8 will be mechanically treated; Unit 13, a goshawk protected area core (PAC) will

be hand-thinned resulting in a higher basal area that is above bark beetle attraction thresholds, but any density reduction from current levels is still beneficial to mitigating insect attack.

In areas where gaps are created from tree or brush reduction, FHP recommends planting of rust-resistant sugar pine if possible. Infection levels are currently low; there is no need to remove infected trees. However, this exotic rust eventually overwhelms smaller trees or makes them more susceptible to further damage agents that will kill them (ex: mountain pine beetle, *Dendroctonus ponderosae*). Replanting of resistant stock improves chances for retaining sugar pine in the stand for future generations.

Given the high level of mistletoe infection of the firs – especially small firs in unit 13 – the outlook for a future stand of healthy fir on this unit is marginal. We recommend an aggressive thinning of the worst mistletoe infested pole-sized and smaller firs. With the object of producing a future fir component that is much healthier than the current fir component, we suggest leaving as many as possible white pines and incense cedars around "healthy" (mistletoe-free) small firs so they will buffer mistletoe seeds shot from neighboring infested trees. In addition, interspersed root systems of pines and cedar will break up the underground landscape of linked fir root systems, thus contributing to also interrupting tree-to-tree spread of any *Heterobasidion* that is present or becomes established in the stand.

Forest Health Protection supports the silvicultural prescriptions outlined by Paul. We strongly applaud the use of a registered borate-base compound on freshly cut stumps to prevent further distribution of root disease in both units, despite the low detectable level of *H. occidentale* in unit 13. As the root systems of fir trees regularly graft to each other; in dense fir stands, root systems becomes more like a communal or "clonal" root system than independent tree root systems. Thus when the stand level of *Heterobasidion* root dieses infection is lowest is where the application of a borate stump dressing pays the largest long-term dividend. Prevention rather than suppression of *Heterobasidion* is the best management. As the spores of this fungus could travel several miles the current low level of infection in stand does not mean that it will remain disease-free post-treatment if the stumps are not protected.

If there are any questions or concerns regarding this report, please do not hesitate to contact us.

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